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EXPERIMENTS ON CONTAGIOUS ABORTION
FIELD IMMUNISATION EXPERIMENTS WITH A VACCINE—PREPARED FROM STRAIN 45

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In a former article (McEwen, 1937), the results of vaccinating non-reacting cattle in infected herds with a live but non-virulent vaccine prepared from *Br. abortus* strain 45, were given. The methods of preparing and using the vaccine and of interpreting results that were then described have been adhered to. Stated briefly, these were as follows: The vaccine was prepared from 48-hour growths on liver agar; before an animal received the first inoculation of vaccine its serum gave a negative reaction to the agglutination test; both pregnant and non-pregnant animals were vaccinated, but the former were not inoculated if they were within two months or less from the date when they should normally calve; an initial course of three inoculations of vaccine at intervals of two months or slightly longer was given and later one inoculation was given after every calving; wherever possible bacteriological examinations were made on the aborted foetuses or their membranes; in some cases when the foetus was not obtained the milk was examined for *Br. abortus*; in all cases of abortion the serum was tested for agglutinins and where bacteriological examinations of the foetus or milk had not been made a diagnosis of the presence or absence of *Br. abortus* infection had to be given on an interpretation of the test for serum agglutination.

In no instance has an aerobic strain of *Br. abortus* been recovered from any vaccinated animal; all those strains that were recovered were CO_2 sensitive and virulent for guinea-pigs; they were, therefore, field strains and not the vaccine strain.

The first report was on eight vaccinated herds and soon after the data had been collected, two of the herds, Nos. 3 and 8, were sold and could not be followed any further. Vaccination was continued in the remaining six herds and more information was obtained from them. Vaccination has, however, now been stopped in three of the herds, Nos. 4, 5 and 7, in two herds because the owners decided to have tuberculin tested herds and the inoculation of the animals with live vaccine had, therefore, to be discontinued; in the third herd because it was moved to other premises and the owner used this as a pretext for giving up the somewhat burdensome plan of vaccination he had been asked to comply with. The plan required the blood sampling of all the vaccinated cattle every two months and of all the animals in the herd every six months and the transmission of blood samples and individual breeding histories to the laboratory.

In the first eight herds the disease was active when vaccination commenced and although, as time went on, the original infected animals became reduced in numbers, the infected portions of the herds, except in herd 5, were kept replenished throughout the course of the experiments by the introduction of infected animals. Similar conditions prevailed in herds Nos. 9 to 14, that are now reported on for the first time. Before vaccination began in these herds the percentages of reacting animals among those that had had one or more calves were 40, 52, 20, 29, 21 and 35 respectively and in all of the herds abortions had recently occurred among the reactors. As no efforts were made to control the disease by the segregation of reacting animals or their isolation at the time of calving the conditions in all of the herds throughout the course of the experiments were regarded as favourable for the spread of the infection.

The results of vaccination are summarised in Table I (*over-leaf*). Animals that became infected in any one year have not been recorded in any subsequent year. The data have only been collected from animals that have been followed for a minimum period of two years or would have been followed for that time had they remained in their herd, after receiving their first inoculation of vaccine.

In the first year 8·5 per cent. of all pregnancies ended in abortion due to *Br. abortus* infection. When the vaccinated non-infected animals were followed into and through the second year after each had been first vaccinated the percentage of pregnancies that terminated in abortion due to Brucella infection was reduced to 0·64 per cent. The data from animals that have completed their third, fourth and fifth years from the time when they were first vaccinated, show that no abortions attributable to *Br. abortus* occurred.

When the animals that became infected but did not abort are added to those that aborted because of Brucella infection, it is found that during the first year 8·7 per cent. of the 287 animals vaccinated showed evidence of infection. During the second year, and during the third and subsequent years no animal that did not abort became infected.

In only three of the herds was it possible to have control animals and the figures for these are shown enclosed in brackets in Table I. They show that during the first year 4 or 16·6 per cent. of 24 completed pregnancies ended in abortion due to *Br. abortus* infection, and that 1 or 9·09 per cent. of pregnancies ended in abortion during the second year. The number

TABLE I
SHOWING THE DATA COLLECTED FROM VACCINATED ANIMALS IN 14 HERDS

No. of Herd.	Total No. Vaccinated.	No. Calved.	No. aborted *Br. abortus* Infection.	No. of abortions not due to *Br. abortus* Infection.	No. which did not Calve.	No. sold not included in Columns 3, 4, 5 or 6.	No. sold from Columns 3, 5 or 6.	Total Sold.	No. of non-aborting cows that became Positive Reactors.
					1st Year.				
1	10	7	—	—	3	—	—	—	1
2	25 (8)	17 (4)	— (1)	—	3 (3)	5	3 (1)	8 (1)	—
4	9	6	—	—	3	—	—	—	—
5	14	8	—	—	5	1	1	2	—
6	18	11	—	—	—	7	—	7	1
7	32	15	3	3	4	7	2	9	—
9	34	17	8	1	4	4	—	4	4
10	21	11	1	—	2	7	—	7	2
11	20	15	—	—	2	3	1	4	—
12	31 (21)	24 (11)	1 (3)	1 (2)	4 (1)	1 (4)	— (4)	1 (8)	—
13	37	24	4	—	4	5	3	8	—
14	36 (4)	14 (3)	—	7	8	7 (1)	1	8 (1)	—
	287 (33)	169 (18)	17 (4)	12 (2)	42 (4)	47 (5)	11 (5)	59 (10)	8
					2nd Year.				
1	9	7	—	—	1	1	1	2	—
2	17 (6)	12 (3)	—	1	2 (2)	2 (1)	2 (1)	4 (2)	—
4	10	3	—	1	4	2	—	2	—
5	13	11	—	—	1	1	—	1	—
6	10	7	—	1	—	2	1	3	—
7	19	13	—	2	—	4	1	3	—
9	19	15	—	—	2	1	—	1	—
10	11	11	—	—	—	—	—	—	—
11	16	12	1	—	—	3	1	4	—
12	28 (10)	21 (6)	— (1)	—	2 (1)	5 (2)	2 (1)	7 (3)	—
13	26	18	—	—	4	3	1	4	—
14	28 (3)	17 (1)	—	3	3 (1)	5 (1)	1	6 (1)	— (1)
	206 (19)	147 (10)	1 (1)	8	19 (4)	29 (4)	10 (2)	39 (6)	— (1)
					3rd Year.				
1	9	4	—	1	—	4	1	5	—
2	7	4	—	—	1	2	—	—	—
4	25	15	—	3	4	3	3	6	—
5	14	13	—	—	—	1	—	—	—
6	11	9	—	—	—	2	—	2	—
7	19	12	—	5	—	2	3	5	—
	85	57	0	9	5	14	7	18	0
					4th Year.				
1	21	12	—	1	1	7	1	8	
2	14	11	—	—	2	1	3	4	
4	16	15	—	—	1	—	4	4	
7	3	3	—	—	—	—	—	—	
	54	41	0	1	4	8	8	16	
					5th Year.				
1	10	8	—	—	—	2	6	8	
2	9	7	—	—	2	—	1	1	
	19	15	0	0	2	2	7	9	

The figures enclosed in brackets refer to control animals. Premature calvings have been included in the Table as abortions. A number of the *Br. abortus* infected animals aborted a second time but these second abortions have not been included. Where a non-infected animal aborted more than once, the second or third abortions have been recorded in the Table.

of control animals is insufficient however to permit significance being attached to the data they supply.

The figures regarding the results of vaccination that were presented in the former report have been combined with those in Table I and are shown in Table II.

It is apparent from Table II that during the first year vaccination has not prevented a considerable number of animals from becoming infected and the majority of these aborted, but from the second year onward, the percentage of pregnancies among the vaccinated animals that ended in abortion due to

TABLE II
SUMMARISING THE COMBINED RESULTS OBTAINED IN 14 VACCINATED HERDS

Total No. of Animals Vaccinated.	Total No. of Pregnancies concluded.	No. that Aborted owing to *Br. abortus* Infection.	No. that became Infected with *Br. abortus* but did not Abort.	Total percentage of Vaccinated Animals that became Infected.
1st Year 519 (148)	356 (63)	27, 7% (5, 7·9%)	3 (4)	7·3 (6)
2nd Year 390 (99)	291 (76)	3, 1% (7, 9·2%)	1 (9)	1·1 (16)
3rd Year 143 (34)	107 (20)	0 (3, 15%)	0 (4)	0 (20·6)

The figures enclosed in brackets represent control animals.

Brucella infection is agreeably low and during this period only one animal that did not abort became infected. It has already been pointed out (McEwen 1937), that any increased resistance shown by vaccinated animals during the second and subsequent years after vaccination, is not due to the elimination of naturally susceptible animals, and in none of the herds can it be shown that the animals from the second year onwards were exposed to only a slight risk of infection. It has been shown (McEwen and Roberts 1936 and McEwen and Priestley 1938) that guinea-pigs vaccinated with living cultures of strain 45 have an increased resistance to infection, and there is also evidence that cattle vaccinated with this strain and then exposed to an experimental infection with a virulent strain of *Br. abortus* possess a resistance to the infection which is greater than that of non-vaccinated normal animals (McEwen 1939). It is, therefore, justifiable to regard the favourable results obtained during the second and subsequent years as indicating that vaccination has called forth an immunity which is sufficient to protect the great majority of the animals under natural conditions of exposure. This is encouraging, particularly as it is probable that with a less attenuated vaccine a superior resistance would be obtained, and it is possible that such a vaccine might be used with safety and without causing any vaccination infection were animals to receive preliminary inoculations with a culture from strain 45.

In view of the fact that the vaccinated animals in all the herds had been exposed to a risk of infection before they were vaccinated, it is probable that many of the animals that showed evidence of infection during the first year were infected before they were vaccinated, although at that time serum agglutinins could not be demonstrated. McEwen, Priestley and Paterson (1939), have shown that when cattle are exposed to infection with decreasing doses of *Br. abortus*, the interval between infection and the appearance of serum agglutinins increases as the size of the infective dose decreases and that with a small infective dose the interval might be as long as 100 to 200 days. It is therefore likely that in many cases of natural infection the appearance of agglutinins does not occur until several months after infection. Accordingly the vaccination of non-reacting animals in infected herds must always be accompanied by the danger of inoculating animals that are already infected and some of these animals will abort and react positively, or if they do not abort will become positive reactors to the agglutination test. For this reason, spectacular results are not to be expected during the first year from the vaccination of cows in infected herds, particularly pregnant cows, although the vaccine might produce a complete immunity to infection. The immunisation of the adult cattle in infected herds would always be a benefit, but to obtain the best results non-infected animals should be vaccinated before entering the infected herd. The vaccination of young animals before they enter the milking herd will, in the great majority of herds, meet this requirement and would be best adapted to herds that are recruited from home-bred stock.

Altogether in the 14 herds, 519 animals were vaccinated, but only 380 of them were followed into a second year from the time the vaccination of each animal began. Thirty-eight of the 519 cows were eliminated during the first year because they were found infected with *Br. abortus* and after deducting these it was found that another 100 animals were lost from the experiment during the first year owing to sales, disposals and a few deaths. This represents a yearly loss of 26 per cent. of the cows and it shows that in experiments where the same animals are followed for any length of time, the numbers that can be followed become much smaller each year. In field immunisation experiments not only is there a loss of animals in the herds that are retained, but before two years are completed some herds are lost through dispersal, registration as tuberculin tested, and the disinclination or inability of those in charge of the herd to maintain the work they are required to do. Through the loss of herds and a yearly loss of over 20 per cent. of the cows in the herds that remain, the number of animals that enter a critical second year is only a fraction of those originally vaccinated. Furthermore, in contagious abortion experiments, the important criterion is the manner in which pregnancy terminates, but every animal that is breeding normally does not calve within a twelve months' period of its preceding calving and in most herds a certain amount of temporary or permanent sterility occurs. It follows that during any year the number of vaccinated animals that complete a pregnancy will be appreciably less than those entering the experiment at the beginning of that year. If the results now reported are combined with those previously recorded (McEwen, 1937), it is found that in the 14 herds only 291 animals completed a pregnancy during the critical second year; this is only 56 per cent. of the number first vaccinated in these herds. What may have appeared a moderately extensive experiment at the start will, therefore, in the course of the second year, have shrunk to disappointing proportions. Nevertheless, the recording of results for a period when the individual animals have been followed for less than two years will almost inevitably convey a false impression, and in field immunisation experiments against contagious abortion of cattle, the data

collected from animals during the first year of vaccination should not be regarded as capable of supplying information that could condemn the immunising value of the vaccine used.

Summary

Further data are submitted to show that the vaccination of non-infected animals in infected herds with a living vaccine prepared from the non-virulent strain 45 confers protection against infection in the field. This protection becomes evident during the second and subsequent years that the animals have been vaccinated. The vaccination of non-reacting adult animals in infected herds is unavoidably attended by the risk of vaccinating infected cattle that are showing no serum agglutinins. A number of abortions due to *Br. abortus* infection are, therefore, most likely to occur among the vaccinated especially during the first year; these are no reflection on the efficacy of the vaccine.

Some of the factors governing field vaccination trials have been discussed.

References

McEwen, A. D. (1936.) *Vet Rec.* **49.** 1585.

———. (1939.) *J. comp. Path.*, **52.** 129.

———, and Priestley, F. W. (1938.) *Vet. Rec.* **50.** 1097.

———, ———, and Paterson, J. D. (1939.) *J. comp. Path.* **52.** 116.

———, and Roberts, R. S. (1936.) *Ibid.* **49.** 97.

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APPENDIX

Particulars of Vaccinated Animals shown in Table I that Aborted or Calved Prematurely

It was pointed out in the former report on field immunisation experiments that non-infected cattle reacted to the agglutination test after they were vaccinated with strain 45. Different animals show considerable variation in the titres of their sera and the serum of an animal that has received two or more inoculations of vaccine may show a titre of 1 : 640 at or soon after the time of calving. Such a titre is, however, not maintained, and if the animal is tested a few weeks later the titre will have dropped to 1 : 320 or less. A persistent titre of 1 : 320 is sometimes found and a persistent titre of 1 : 160 is frequently produced in cattle as long as they are being vaccinated regularly.

In considering the titres shown by the animals that aborted or calved prematurely, a titre of 1 : 640 at the time of aborting or calving or a titre of 1 : 320 some time later has been accepted as evidence of actual infection with *Br. abortus* unless there were other reasons for concluding that the abortion was not due to a uterine infection, such as the abortion of a small foetus three months or less after service. Where animals have received only one inoculation of vaccine a titre of 1 : 160 some time after an abortion or a premature calving has caused the animal to be classed as infected. This system of classification will, if anything, tend to condemn some animals that are actually non-infected.

Animals that Aborted or Calved Prematurely during their First Year of Vaccination and were regarded as Infected with *Br. abortus*

Herd 7.—No. 79: three inoculations of vaccine. Aborted a four months foetus: titre eight days later 1 : 640, and two months later 1 : 320. Guinea-pigs inoculated with gravity cream: negative.

No. 89: three inoculations. Calved prematurely: titre two months later 1 : 640, persisted for two years. Guinea-pigs inoculated with gravity cream: negative.

No. 108: three inoculations. Aborted a six to seven months foetus: titre before and after abortion 1 : 640. Aborted at next pregnancy: titre 1 : 640.

Herd 9.—No. 24: one inoculation. Aborted at five months: titre two months after inoculation 1 : 40, later 1 : 320.

No. 25: one inoculation. Aborted a seven months foetus: titre before abortion 1 : 640. *Br. abortus*, CO_2 sensitive, recovered from milk.

No. 33: two inoculations. Aborted a seven months foetus: titre after abortion 1 : 640. *Br. abortus* CO_2 sensitive, recovered from foetus.

No. 34: two inoculations. Aborted a seven months foetus: titre five weeks later 1 : 640. *Br. abortus*, CO_2 sensitive, recovered from foetus.

No. 38: two inoculations. Calved prematurely: titre after calving 1 : 640. Aborted at next pregnancy: titre 1 : 640.

No. 40: one inoculation. Aborted at eight months: titre before and after abortion 1 : 640.

No. 58: three inoculations. Calved two weeks prematurely: titre six days later 1 : 640.

No. 35: one inoculation. Aborted at eight months: titre six weeks later 1 : 640. Guinea-pigs inoculated with gravity cream: negative.

Herd 10.—No. 1: two inoculations. Aborted a seven months foetus: titre two days later 1 : 640. *Br. abortus*, CO_2 sensitive recovered from foetus.

Herd 12.—No. 116: three inoculations. Aborted a seven to eight months foetus: titre after abortion 1 : 640, nine months later it was the same. *Br. abortus*, CO_2 sensitive, recovered from foetus.

Herd 13.—No. 14: one inoculation. Aborted a four months foetus: titre 1 : 640. *Br. abortus*, CO_2 sensitive, recovered from foetus.

No. 17: one inoculation. Aborted a seven months foetus: titre six days later 1 : 640; three months later 1 : 320; fourteen months later 1 : 80. Foetus negative.*

No. 18: one inoculation. Aborted at seven to eight months: titre three months later 1 : 160.

No. 22: one inoculation. Calved slightly prematurely: titre 1 : 640; this titre persisted for 2½ years.

Animals that Aborted during their Second Year of Vaccination and were regarded as Infected with *Br. abortus*

Herd 11.—No. 36: three inoculations. Aborted a six months foetus: titre 12 days later 1 : 640. *Br. abortus*, CO_2 sensitive, recovered from her milk.

Animals that Aborted during the First Year of Vaccination but were regarded as Not Infected with *Br. abortus*

Herd 6.—No. 68: three inoculations. Aborted a two to three months foetus: titre three weeks later 1 : 20. Foetus negative.* Animal revaccinated.

No. 106: two inoculations. Aborted at two months: titre four weeks later 1 : 320. Animal revaccinated.

No. 127: three inoculations. Aborted at eight months: titre six weeks later 1 : 10. Animal revaccinated.

Herd 9.—No. 57: three inoculations. Aborted at seven-and-a-half months: titre three months later 1 : 40. Animal revaccinated.

Herd 12.—No. T1: three inoculations. Aborted a six months foetus: titre 1 : 10. Foetus negative.*

Herd 14.—No. 9: two inoculations. Aborted a three to four months foetus: titre three weeks later 1 : 80. Foetus negative*. Animal revaccinated.

No. E.T.5: three inoculations. Aborted at eight to nine months: titre six weeks later 1 : 320, twelve weeks after abortion 1 : 160. Agglutinins for *V. foetus* were also present, and as *V. foetus* had been recovered from other foetuses from this herd it was concluded that abortion was probably due to that organism.

No. 25: three inoculations. Aborted a five months foetus: titre three to four weeks later 1 : 20. Foetus negative*. Animal revaccinated.

No. 33: three inoculations. Aborted a four to five months foetus: titre two months later 1 : 20. Foetus negative*. Animal revaccinated.

No. 35: three inoculations. Aborted an eight to nine months foetus: titre two months later 1 : 40. Foetus negative*. Animal revaccinated.

No. E.T.6: three inoculations. Aborted an eight months foetus: titre before and two months after abortion 1 : 80. *Cl. septique* isolated from the foetus. Guinea-pigs inoculated with gravity cream: negative, animal revaccinated.

No. E.T.7: Two inoculations. Aborted a foetus of uncertain age: titre six weeks later 1 : 320, but three months after abortion 1 : 40. Foetal membranes negative.† Guinea-pigs inoculated with gravity cream: negative. Animal revaccinated.

ANIMALS THAT ABORTED OR CALVED PREMATURELY DURING THEIR SECOND OR SUBSEQUENT YEARS OF VACCINATION AND WERE REGARDED AS NOT INFECTED WITH *Br. abortus*.

Herd 1.—No. 47: Calved prematurely during third year: titre on day of calving and two months later 1 : 80. Calf negative*. Animal revaccinated.

No. 12: aborted a six months foetus during fourth year: titre on day of abortion and two months later 1 : 40. Foetus negative*. Animal revaccinated.

Herd 2.—No. B.54: aborted at five months during second year: titre two months later 1 : 80. Animal revaccinated.

Herd 4.—No. 45: aborted at nine months during second year: titre nine days and six weeks after abortion 1 : 20. Guinea-pigs inoculated with gravity cream: negative. Animal revaccinated.

No. 26: aborted a five to six months foetus during third year: titre sixteen days and again three months after abortion 1 : 160. Foetus negative*.

No. 37: aborted an eight months foetus during third year: titre two months later 1 : 80. Foetus negative*. Animal revaccinated.

No. 40: aborted at seven to eight months: titre eight days later 1 : 80: titre of whey, negative at 1 : 10. Animal revaccinated.

Herd 6.—No. 33: aborted at four to five months during second year: titre eleven days and again two months after abortion 1 : 80. Animal revaccinated.

Herd 7.—No. 68: aborted during the first, second and third years. The bacteriological examination of the first foetus: negative. Titre forty days after second abortion 1 : 160. Animal revaccinated. Titre three weeks after third abortion 1 : 40.

No. 160: aborted at five to six months during second year: titre one day and again four weeks after abortion 1 : 40. Animal revaccinated.

No. 9: aborted at eight months during third year: titre 19 days later 1 : 20. Animal revaccinated.

No. 72: aborted twice during third year. First foetus five to six months: titre four weeks after abortion 1 : 10. Animal revaccinated. Second foetus five months: titre after abortion 1 : 20.

No. 109: aborted at four to five months during third year: titre three months later 1 : 40. Animal revaccinated.

Herd 14.—No. 2: aborted a seven months foetus during the second year: titre after abortion 1 : 20. Foetus negative*. Animal revaccinated.

No. 43: aborted a six months foetus during second year: titre thirteen days later 1 : 80. Bacteriological examination of foetus negative. Animal revaccinated.

No. 47: aborted at eight months during second year: titre four weeks later 1 : 40. Animal revaccinated.

*The stomach contents and material from the liver, spleen and kidneys were cultivated on suitable media. Stomach contents were also inoculated into guinea-pigs and the animals killed and examined for *Br. abortus* infection one month later.

†Material from the foetal membranes was examined for *Br. abortus* by cultural means and by the inoculation of guinea-pigs.

THE *p*H (HYDROGEN ION CONCENTRATION) OF THE CONTENTS OF THE DIGESTIVE CANAL OF THE EQUINE*

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In the course of experiments to determine the relationship between the hydrogen ion concentration of the caecum of the horse and the infestation with *Strongylus vulgaris* (Whitlock and Leasure,[1] 1939), it was found that the data obtained were not entirely in agreement with the results of previous investigators. This discrepancy suggested the determining of the *p*H value of the remaining sections of the digestive tract of the horse.

MATERIALS AND METHODS

The subject material was aged horses (10 or more years of age) made available through the courtesy of the Hill Packing Company of Topeka, Kans. The history and breeding of these animals were not known. They would, however, represent what one would expect to find in a horse-slaughtering establishment. Of the feeding nothing definite was known, those animals that were received at the plant on operating days were for the most part slaughtered immediately; those received on off days and any holdovers were fed prairie hay and grain. All determinations of *p*H reported herein were taken within an average time of from 8 to 20 minutes after the death of the animal. It is believed, therefore, that little if any change of reaction (*p*H) occurred following the animal's death.

The determinations were made with a quinhydrone potentiometer accurately standardised before each series of determinations. Proper temperature corrections were made for all samples determined. All water used for rinsing vials or for diluting was accurately adjusted to the neutral point (*p*H7).

As the specimens reached the offal room (stomach, duodenum, jejunum, ileum, caecum, large intestine, and rectum) they were immediately incised and sufficient fluid content collected and filtered through neutral gauze for at least two determinations. In some specimens it was necessary to express the fluid substance from the solids in the stomach, and this was necessary for all determinations made of the faecal material of the rectum.

The fluid substance was diluted only in those samples containing a high percentage of mucin or catarrhal exudate. Dilutions with neutral water were usually 1 : 1 or 1 : 2 and were necessary for a few stomach readings and about 20 per cent. of the duodenal and ileac readings. It was found that these dilutions were not sufficient to cause a variation in the readings. In this latter respect the authors are in agreement with Mayhew,[2] who states, that "*p*H determinations were not altered by dilutions of 1 : 3 unless the original material was small."

In the first part of the experiment many filtered fluid samples were centrifuged by means of a hand centrifuge for from one to two minutes but after it was found that

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this procedure did not alter the reading of the original sample, it was discontinued. Throughout the experiment, second and third readings were frequently taken of original samples to serve as a check on the technique and in no instances were appreciable errors found.

As stated in a previous paragraph, the samples became available on an average of from 8 to 20 minutes after death of the animal, therefore, the *p*H determinations for the various parts of the digestive canal recorded are not on the same canal (the time element being the limiting factor). In some instances, however, readings were taken for the stomach, large intestine, and caecum, and all readings for the three parts of the small intestine were taken on the same canal.

In a review of the literature little information was found relative to the *p*H of the various parts of the digestive tract of the horse, while considerable data are available on other animals and man. Table I gives the summary of the results of other investigators.

TABLE I

Summary of the Results of Other Investigators (pH of the Digestive Tract of the Horse)

Section of Digestive Tract	Investigator: Danninger-Pfragner and Schultes (3)	Potting (4) (Dukes)	Swarz-Sienwetzer and Caihnal (5) (Dukes)
Stomach			1·1308-6·7969
Duodenum	5·12 -7·48		
Ileum	6·135-7·695		
Caecum	7·608-8·955 (mean 8·12)		
Rectum		6·5-6·68	

While the determinations in this experiment differed somewhat from those in Table I, it is believed that these variations are logical since it was observed that the alkalinity of the caecal and large colic contents increased greatly as the time after death increased, and the Danninger-Pfragner and Schultes determinations were made some hours after death. Our determinations, made soon after death, probably represent a more nearly normal picture. The reason for this rapid change of reaction in all probability is the changing of the carbon dioxide saturation of the contents when exposed to the air. Experimental evidence tends to indicate that this is true and such evidence will be discussed in a later paper.

Experimental Data

Table II gives the number of determinations, range in *p*H value and average *p*H value for the contents of the various parts of the digestive tract. The *p*H range varies within quite wide limits and especially for the stomach contents, 14 of which were too acid to be recorded and quite a number were at the very lower limits of the potentiometer.

The duodenal and ileac contents in about 20 per cent. of the cases were quite mucilaginous in consistency and required diluting with neutral water. The alkalinity increased with increases in catarrhal and mucilaginous exudate, and this seems to parallel the findings in mastitis of cattle. The samples of fluid contents of the three divisions of the small gut represent a mixture of the contents of approximately the full length of each division. The samples of caecal contents were collected generally from the caecal apex, and those of the large colon were collected generally from the region of the pelvic flexure.

TABLE II

The pH of the Contents of the Digestive Tract of the Equine

	No. of Determination	Range in *p*H	Average *p*H	Remarks
Stomach	104	2·01	8·60	4·458 14 additional
Duodenum	71	6·48	8·48	7·130 stomach read-
Jejunum	70	6·87	7·80	7·467 ings were be-
Ileum	71	5·88	8·03	7·548 low the range
Caecum	190	6·02	7·91	7·235 of the potenti-
Large colon	135	6·39	8·61	6·09 ometer.
Rectum	21	5·39	7·13	6·24

TABLE III

The pH (Hydrogen Ion Concentration) of the Contents of 33 Equine Stomachs (Fullness of Stomach Based Upon Three Gallons Average Capacity)

	No. of Stomach readings	Fullness	Range of *p*H	Average *p*H
	9	Empty	2·01-8·60	4·63
Equine	9	⅛ to ¼ full	2·03-6·55	3·29
Stomachs	11	½ full	2·03-5·17	3·28
	1	¾ full		2·43
	3	full	2·03-5·34	3·85
Total	33			

Table III represents the *p*H of the contents of 33 equine stomachs (not selected) in which especial attention was given to the fullness of the stomach. In no instance was the entire contents of the stomach measured accurately, as the observations were merely estimates and fullness of stomach was based upon a three gallon average capacity. On this basis it is interesting to note that 9 of the 33 stomachs were completely empty, save for only a slight amount of fluid or mucilaginous substance. As stated previously, the history of these animals was not known; nevertheless, the observations conclusively prove that a horse's stomach completely empties itself. The *p*H range for the empty stomachs is somewhat greater than for the other stomachs, one empty stomach being quite alkaline in reaction (*p*H 8.6).

Summary

The *p*H of the contents of the various divisions of the digestive tract of aged equines was measured in a large number of individuals. The range of *p*H was found to vary within quite wide limits in animals that were assumed to be normal.

It was observed that the *p*H values were considerably higher when the contents of the gut contained large quantities of catarrhal or mucilaginous exudate.

A good many of the 118 stomachs examined were observed to be practically empty save for a slight amount of fluid substance. While the feeding history was not known it is extremely unlikely that the animals were without food for periods as long as 36 hours.

Hydrogen ion determinations of the digestive contents should be conducted shortly after the animal's death in order to obtain accurate results.

The average *p*H of the contents of the various sections of the equine digestive tract was found to be as follows: stomach 4·458, duodenum 7·130, jejunum 7·467, ileum 7·548, caecum 7·235, large colon 7·09, and rectum 6·24.

References

[1]Whitlock, J. H. and Leasure, E. E., Studies upon *Strongylus vulgaris* I. The Incidence of *Strongylus Vulgaris* in Mid-continental North America and the Reaction of the Infested Ceca. *Amer. J. Hyg.*, **29**, 2 Sec. D, May, 1939.

[2]Mayhew, Roy I., The Hydrogen-ion Concentration of the Digestive Tract of the Fowl. *J. Amer. Vet. Med. Assoc.* Vol. XXXVI, N.S. 39, No. 2, February, 1935, pp. 148-152.

[3]Danninger, Rudolph., Pfragner, Karl, and Schultes, Hans. Uber die Absolute Reaktion in dem Inhalt Der Einzelnen Darmabsihuitte von Pferd und Rind: *Pflügers Archiv. f. d. Gesamte Physiol.* **220**: 430-433.

[4]Pötting, B., Cited by Dukes, H. H. *The Physiology of Domestic Animals*, 4th edition, Comstock.

[5]Swarz, C., Steinwetzer, Karl, and Caithnal, K., Cited by Dukes, H. H. *The Physiology of Domestic Animals*, 4th edition, Comstock.

H.M. STATIONERY OFFICE PUBLICATIONS

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	Price net s. d.	*Post free* s. d.
Scientific and Industrial Research, Department of:		
Food Investigation Board. Index to the Literature of Food Investigation, Vol. II. 2, September, 1939. (47-71-25)	4 6	4 7
War Office:		
Allowances of the Army, Regulations for, 1938. Amendments 14, 15, November, 1939. (57-9999.) ...	0 1	0 1½
King's Regulations for the Army and the Army Reserve, 1935: Amendments 1 to 47 (in one volume). (57-203-47-35.)	4 0	4 4
Amendments 50. November, 1939. (57-9999.)	0 1	0 1½
Officers' Employment. Termination of Officers' Employment, Resignation and Retirement in Time of War (Special Army Order 249). December 15th, 1939. (57-9999.)	0 1	0 1½
Royal Army Reserve. Regulations for Class W (including the Supplementary Reserve) and Class W (T), Territorial Army Reserve (Special Army Order 251). December 15th, 1939. (57-9999.)	0 1	0 1½
Supplementary Reserve. The Reversion to Non-Employment of Officers of the Supplementary Reserve (Special Army Order 250). December 15th, 1939. (57-9999.)	0 1	0 1½
Territorial Army (including the Territorial Army Reserve), and County Associations, Regulations for, 1936. Amendments 48, 49 (Special Army Order 248, December 15th, 1939). (57-9999.) ...	0 1	0 1½
Statutory Rules and Orders:		
1855. Chartered and other Bodies (Temporary Provisions). The Universities and Colleges (Temporary Provisions) Order in Council, dated December 20th, 1939	0 2	0 2½

THE VETERINARY RECORD

January 13th, 1940.

THE POULTRY INDUSTRY UNDER CONDITIONS OF WAR

THE Minister of Agriculture and Fisheries in the early days of the present war, spoke on the desirability of keeping poultry, and of the hen as a most economical converter of waste foods. His words were addressed primarily to householders who might be encouraged to keep a few hens to supply their own requirements of eggs, using the food scraps from the house to supplement or replace the various constituents of the normal foodstuffs formerly used. Since the Minister made this appeal, the situation with regard to the supply of imported foodstuffs for poultry has become difficult owing to the failure to obtain grain, or grain offal for mashes. There is a risk that with a shortage of the usual feeding stuffs, particularly where householders inexperienced in feeding poultry are mainly using household waste foods, rations may become badly balanced with consequent ill effects upon the health of the birds.

The success of any livestock industry depends upon the breeding stock and it is therefore important that under present conditions special provision should be made for the conservation and adequate feeding if this breeding stock. The men in control of this vital section of the industry would be well advised to arrange the management of their flocks with some return to natural conditions in place of the intensive methods which have become popular. The maximum food supply should be obtained from the land and free range conditions will assist this, by ensuring that the birds have the opportunity of grazing, thereby reducing the consumption of imported foodstuffs. Other advantages are that they will obtain the natural vitamins from the sunlight and herbage, which will reduce the quantity of cod liver oil required to be imported; that the birds will gain in bodily condition, vigour and fertility, and that the land will be enriched by the manure and harrowing by the flock, and thus be prepared for growing valuable food crops.

A separate rearing ground is a valuable factor in the prevention of worm infestations and coccidiosis. Adequate acreage should be maintained as a rearing ground, which should be kept free from poultry stock, following the transference of the birds to their growing quarters, until another season. In the meantime, it should be well grazed with sheep, etc., or the grass should be kept short by sheep or by other means. Where a large acreage of land is available, a piece of land which has not been used for poultry for some years may be available each year as a rearing ground.

We can expect an increase in the incidence of many non-specific diseases which are caused by

feeding errors, notably the vitamin and mineral deficiency diseases.* Calcium deficiency results in a slow rate of growth in chickens, abnormal bone formation, leg weakness and poor rearability. In adults, this deficiency causes poor egg production, thin-shelled eggs, low hatchability and the production of weakly chickens. Excess of phosphorus causes perosis and slow growth. These conditions affect both present and future generations.

It is essential in these times that only first quality birds should be maintained for breeding and other purposes, in order that the highest state of efficiency of production can be maintained. To attain this state, culling must be practised regularly, in order that every second grade bird is removed and utilised for table purposes.

Special attention should be paid to the hygienic condition and ventilation of the houses. If these features are neglected serious outbreaks of colds or coccidiosis may develop.

The importance of maintaining a very efficient control over the flocks must be stressed. Any bird showing signs of deviation from the normal should be removed from the flock at once and placed in isolation. If further cases occur, representative specimens should be sent to a veterinary laboratory for examination. By means of the early detection of symptoms of illness, followed by prompt isolation and submission of specimens for expert examination, many serious outbreaks of disease can be prevented.

It is to be hoped that there will be no relaxation of the attempts to eliminate "carriers" of *Bact. pullorum*, *Bact. sanguinarium*, *Bact. aertrycke* and *Bact. enteritidis* Gaertner by blood testing. Similarly the use of fowl pox vaccine, fowl typhoid vaccine and the tuberculin test, should not be neglected.

If these points are strictly carried out, the position of the industry at the close of hostilities will be a reduced poultry population, but of good quality, ready to act as the foundation stock for the necessary expansion. If this policy had been followed from 1914-1918, the quality of the stock produced between 1918 and the present time would have been immeasurably better and there would probably have been no necessity for the investigations of the Poultry Technical Committee.

*For details of those conditions and causes, reference should be made to the Handbook on Poultry Diseases, issued by the National Veterinary Medical Association of Great Britain and Ireland in 1937.

Resolutions urging the renewal of the grants for assisted nominations are being sent to the Minister of Agriculture by the Shire Horse Societies of Stratford-on-Avon and Shipston-on-Stour. It is being pointed out to the Minister that otherwise there will be deterioration of the type of horse kept on the land through extinction of many societies.

ABSTRACTS

[TERMINATION OF THE VOLAR NERVE IN THE HORSE. (Trans title.) Koch, T. (1939). *Wien. tierärztl. Mschr.* **26.** 293-298. (2 figs.)]

At approximately the level of the upper edge of the sesamoid bones the volar (plantar) nerve divides into two branches—dorsal and volar. The dorsal (anterior) branch (Figs. 1 and 2*b*) is small and passes obliquely across the fetlock joint, parallel with the anterior division of the suspensory ligament, to be distributed to the skin and coronary band in the region of the pyramidal process. The volar (posterior) branch gives off a branch—the middle (Fig. 1*c*) at about the level of the middle of the first phalanx which supplies the triangular area between the anterior slip of the suspensory ligament, the coronary band, and the lateral surface of the first phalanx. This is the more common arrangement.

In other cases (see Fig. 2) the dorsal branch is larger, leaves the volar branch at a more acute angle, passes down the lateral edge of the first phalanx in front of the digital vessels and supplies both the region of the pyramidal process and the triangular area referred to above. The volar (posterior) branch (Figs. 1 and 2*a*) runs immediately posterior to the digital vessels, supplies all areas posterior to the phalanges, including the navicular region, and ramifies on the wall of the os pedis (Figs. 1 and 2*g*). The deep volar metacarpal nerves (Figs. 1 and 2*d*), branches of the ulnar, are distributed to the lateral and medial aspects of the fetlock joint.

In this article due notice is given to the finer distribution of these main branches, and it should prove of practical assistance in the application of regional anaesthesia for the diagnosis of lameness.

C. W. O.

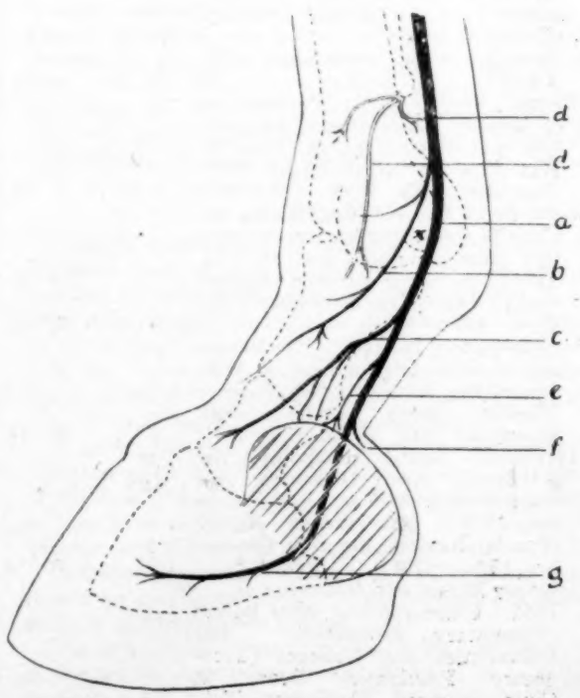

Fig. 1.

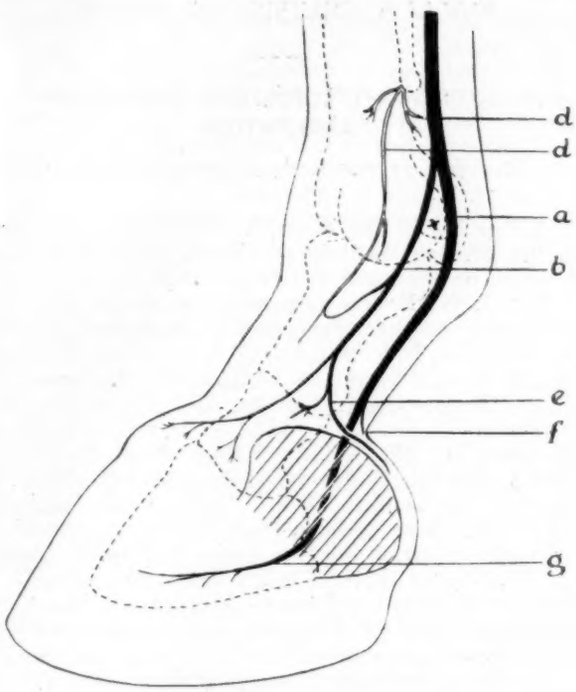

Fig. II.

Figs. 1 *and* 2.—*a*, volar branch of lateral volar nerve; *b*, dorsal branch of lateral volar nerve; *c*, middle branch from the volar branch (Fig. 1 only); *d*, lateral deep volar metacarpal nerve; *e*, cutaneous branch to the lateral cartilage; *f*, branch to the bulb of the heel; *g*, branch to the wall of the os pedis; *x*, angle of bifurcation between the dorsal and volar branches.

* * * * *

[VITAMIN C NUTRITION IN ARTIFICIAL FEVER. Zook, J., and Sharpless, G. R. (1939). *Proc. Soc. Exp. Biol. Med. N.Y.* **39.** 233-236. (1 tab., 10 refs.]

Since a number of studies have demonstrated that vitamin C requirement is increased in pneumonia, tuberculosis, and other diseases, the assumption has been made that fever will increase requirement for the vitamin. There is no experimental basis for this assumption, however, and an investigation was made, therefore, of the effect of artificial fever on vitamin C stores in guinea-pigs, and on vitamin C excretion in man.

Forty-four guinea-pigs were maintained on a scorbutic diet and 21 were given fever treatment by raising the atmospheric temperature to 105° to 106° for two to six hours daily. The remainder were maintained as controls. Groups of guinea-pigs were killed after 4, 7, 15 and 25 days and their tissues analysed by the method of Bessey and King (*J. Biol. Chem.*, **108**, 687). Results showed that the vitamin C stores were depleted faster in the animals subjected to the fever treatment. When a state of scurvy is approached in 15 days, however, the rates of depletion are about equal in experimental and control animals.

In humans, studies were made on vitamin C excretion in the urine and its concentration in the blood. In all four cases recorded excretion was significantly lower following fever treatment than before. Blood concentration of the vitamin, however, was unaltered.

The studies demonstrate that during fever vitamin C requirement is increased in both guinea-pigs and man, and since the former cannot lose vitamin in sweat, an increase in the physiological need for the vitamin is indicated.

D. D. O.

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[IMMUNITY AND IMMUNITY REACTIONS IN PARASITIC DISEASES. Maternowska, I., and Schoenaers, F. (1938). Papers to Thirteenth Int. Vet. Cong.]

Both authors agree that immunological reactions in intestinal parasitisms give varying and not strictly specific results.

Maternowska finds that a more specific reaction is given by tissue parasites than with intestinal ones, though the appearance of the reaction is later. A positive intradermal reaction does not guarantee the presence of intestinal parasites as it may occur after their disappearance.

Schoenaers has studied *Ascaridia galli* and *Heterakis gallinae* whose development is accomplished without passage through the organs of the host. He finds that the presence of specific precipitins or sensitisers is not conclusive or regular—antibodies appearing only when an intimate contact is created between the parasite and the host.

J. S. S.

* * * * *

[TREATMENT OF MALARIA WITH SULPHONAMIDE COMPOUNDS. Léon, A. D. De. *Translation in U.S. Public Health Reports, lii.*]

Fifteen cases of benign tertian malaria were treated successfully with prontosil. The drug was given orally in gradually increasing doses, and symptomatic relief was prompt. Later blood smears were negative for parasites. In only one case did breakdown occur after treatment, and this responded well to intramuscular injections of the drug.

D. D. O.

* * * * *

[OBSERVATIONS UPON THE ABSORPTION AND EXCRETION OF SULPHAPYRIDINE (2 SULPHANILYL AMINOPYRIDINE. Long, P. H., and Feinstone, W. H. *Proc. Soc. Exp. Biol. Med. N.Y.* **39.** 486-491. (3 tabs., 4 refs.)]

Experiments with sulphapyridine in mice, dogs, and human beings show that the drug is less readily and more irregularly absorbed than is sulphanilamide. One-half to two-thirds is excreted in the urine, and it appears in purulent pleural exudates and spinal fluids in only one-half of the concentration observed in the blood. There is great tendency to conjugation of the drug in the blood, and since this fraction is chemotherapeutically inactive, the clinical value of the drug is depreciated. As a therapeutic aid sulphapyridine is, therefore, of less value than sulphanilamide.

D. D. O.

* * * * *

[ACTINOMYCOSIS IN THE DOG. (Trans. title.) Eroms. (1939). *Deuts. tierärztl. Wschr.* **47.** 437-438.]

Two cases are described in which the main feature was a chronic purulent and haemorrhagic inflammation of the serous membranes—pleura in one case, peritoneum in the other—the exudate containing small flocculi and granules which, when crushed, were found to consist mainly of branching Gram-positive filaments. The serous surfaces were rough

and showed numerous nodules and plaques similar to those commonly found in tuberculous pleuritis and peritonitis in the dog These productive lesions consisted of granulation tissue in which were embedded colonies of branching Gram-positive filaments, surrounded by neutrophil leucocytes, histiocytes and "foreign body" giant cells. The regional lymph nodes were enlarged and showed on section the usual changes of chronic non-specific lymphadenitis. No acid-fast bacilli were found in either of the cases.

Colonies similar to those of *Actinomyces bovis* were obtained from the pleural exudate and this material also resulted in the formation of a local abscess 220 days after intramuscular injection into a guinea-pig. The histological structure of the abscess resembled that of the lesions in the dogs and in both cases there was no sign of club formation.

[The abstractor has recently encountered in a young Alsatian a case of purulent and haemorrhagic peritonitis of similar nature to the above—granules, Gram-positive mycelia, etc.]

E. G. W.

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[**BACTERIOLOGY AND VACCINE THERAPY OF ACTINOMYCOSIS.** (Trans. title.) Lentzã, F. A. (1938). *Z. Bakt. Orig.* **141.** 21-36.]

There are several members of the Actinomyces group of organisms responsible for actinomycosis in man. This is apart from actinobacillosis which is rare in man, and in which the organisms isolated have not been identified with certainty as the same as that found in cattle. The anaerobic bacillus of Wolff and Israel, *Actinomyces bovis*, is responsible for cases in which are found colonies or "Drusen" in the form of granules. It is doubtful if the aerobic bacillus which is known to be a saprophyte and often known as *Actinomyces graminis* plays any aetiological rôle. Some other aerobic actinomyces—in this article called streptothrix—have been isolated from clinical cases of actinomyces but these are characterised by the lack of the granules—"Drusen"—found in the conditions due to *Act. bovis*.

From cases of the human disease due to *Act. bovis*, there have been isolated two different forms of anaerobic actinomyces which are distinguished by colony formation and as is usual are known as the "R" and the "S" forms. These two forms are not only different culturally but also show biochemical and serological differences. The r le which these two types play in the aetiology of the disease is not yet clear. It is obvious that a study of the antigens is necessary before one can adopt any method of vaccine therapy and the evidence so far is that the second type of organism, which is similar to a corynebacterium, may be a mutation of the first.

R. L.

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[**PERMEABILITY OF THE MEDIASTINUM IN DOMESTIC ANIMALS.** (Trans. title.) Rapic, S. (1939). Translation of abstract in German in *Berl. tierärzl. Wschr.*, 1939. p. 282. Original article in *Arhiv Vet.*, 1937. pp. 581-595.]

The author studied the permeability of the mediastinum for gases, fluids and bacteria since this is of special importance in the clinical pathology of pleuritis and pneumothorax. The following are the main findings: In dogs not yet fully grown, the mediastinum is impermeable to gases, fluids and bacteria, *i.e.*, pleuritis and pneumothorax remain unilateral if related aetiologically to one pleural cavity only. Conditions are different in adult dogs which have not previously been affected with a productive inflammatory process involving the mediastinum. In such animals pneumothorax is always bilateral, pleuritis usually so. The same holds true for the cat. In horses, in which no previous productive inflammatory changes in the mediastinum have occurred, pneumothorax and pleuritis spread from one pleural cavity to the other. The mediastinum of the other domestic animals forms a septum which is impermeable alike to gases, fluids and bacteria.

E. G. W.

N.V.M.A. DIVISIONAL REPORT

SCOTTISH METROPOLITAN VETERINARY ASSOCIATION

Meeting at the Royal (Dick) Veterinary College

A meeting of the Scottish Metropolitan Division, N.V.M.A., was held in the Royal (Dick) Veterinary College, on Wednesday, October 11th, 1939.

Mr. J. N. Ritchie occupied the Chair and there were also present: Professor G. F. Boddie, Messrs. A. Brownlee, J. W. Burgess, C. B. Davidson, Professor H. Dryerre, Messrs. L. Dougal, H. B. Luxmoore, J. D. Ferguson, A. Gofton, Dr. W. S. Gordon, Professor T. Grahame, Mr. W. Harris, Dr. H. H. Holman, Mr. W. H. Horne, Professor R. G. Linton, Mr. J. Mackie, Professor W. M. Mitchell, Mr. P. G. Morris, Sir Arthur Olver, Major E. S. W. Peatt, Mr. J. F. Player, Major D. S. Rabagliati, Mr. U. F. Richardson, Dr. J. Stewart, Major A. Spreull, Messrs. A. W. Taylor, J. A. Taylor, D. R. Wilson, H. M. Wilson, P. Wilson, Major G. Williamson, Mr. E. G. Wood, and the Hon. Secretary. A number of students were present as visitors.

Apologies for absence were received from Mr. A. Baird and Major J. G McGregor.

Obituary.—The President referred to the loss sustained by the Division and the profession by the death of Major A. Baird, Reston, one of the oldest members of the Division. The members stood for a minute in silent tribute to his memory.

The minutes of the previous meeting, which had been published in the *Veterinary Record*, were taken as read and approved.

Correspondence.—A letter was read from the General Secretary, N.V.M.A., enclosing a copy of the Memorandum on Schemes for the Free Treatment of Sick Animals of the Poor and requesting that it be brought to the notice of the members of the Division.

Report of the Committee on A.R.P. for Animals.—The Hon. Secretary read the report of this Committee, which was appointed at the June meeting to consider the scheme submitted by the National Emergency Committee. In view of Mr. Gofton's appointment as Regional Organiser of the A.R.P. (Animals) Service for the District the Committee recommended that the Division should co-operate whole-heartedly with Mr. Gofton in the matter. The recommendation was unanimously approved by the members present. The Hon. Secretary then gave a brief outline of the

action which had been already taken. In the discussion which followed, Professor R. G. Linton moved that the Division recommend to the National A.R.P. (Animals) Committee that the wearing of webbing halters by horses under their ordinary bridles be made compulsory. The motion was seconded by Mr. H. M. Wilson and carried unanimously.

Election of Office-Bearers.

The following members were elected office-bearers for the year 1940 :—

President.—Dr. J. Russell Greig.

Vice-Presidents.—Mr. J. N. Ritchie and Dr. W. S. Gordon.

Members of Council.—Professor G. F. Boddie, Mr. H. F. Downie, Mr. A. Gofton and Mr. H. M. Wilson.

Hon. Secretary and Treasurer.—Mr. A. Robertson.

Auditors.—Professors R. G. Linton and W. M. Mitchell.

Resignation.—The resignation of Mr. A. R. Withers was accepted with regret.

Nominations and Elections.—The following were nominated for membership of the Division : Messrs. A. T. Cowie, Edinburgh and A. McAinsh, Edinburgh. On the motion of the President, seconded by Professor Linton, Major G. Williamson, Edinburgh, was elected a member of the Division.

Demonstration.—Mr. U. F. Richardson gave a demonstration of cultures and preparations of *Trichomonas foetus* which he briefly described to the members.

Short Talks.—Short talks were then given on the following subjects :—

(1) " Common war injuries and their treatment," by Professor W. M. Mitchell, M.B., Ch.B., B.Sc., M.R.C.V.S.

(2) " Contagious diseases in the horse under war-time conditions," by Major E. S. W. Peatt, O.B.E., F.R.C.V.S., Royal Army Veterinary Corps.

(3) " Diagnosis of gas casualties," by Major G. Williamson, O.B.E., M.R.C.V.S., D.V.S.M.

Brief discussion followed the first two papers, but there was not enough time to allow of discussion of Major Williamson's interesting contribution.

[These papers will be published in early issues of the *Veterinary Record.—Editor.*]

Any Other Business.—Under this heading the President brought up the question of the advisability of continuing the activities of the Division during war-time. After discussion, it was decided to carry on as usual in the meantime but to try and arrange the February meeting on a Saturday forenoon so that members would have no difficulty in getting home before dark.

Professor Linton proposed a vote of thanks to the speakers, which was carried with acclamation. Professor Boddie then pointed out that this was the end of Mr. Ritchie's term of office as President, and called for a suitable recognition of his activities during the preceding year. To this the members present responded heartily.

At the close of the meeting, tea was supplied in the College Refectory. A collection was taken on behalf of the Victoria Veterinary Benevolent Society Fund and amounted to 12s. 6d.

Alex. Robertson, *Hon. Secretary.*

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Jan. 15th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 4 p.m.

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PERSONAL

Birth.—McGreevy. At Rankine Memorial Hospital, Greenock, on December 22nd, 1939, to Mr. and Mrs. J. G. McGreevy, 5, Gaddlehill Street, Greenock, a daughter—both well.

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Colonial Veterinary Service Appointments.—The following first appointments in the Colonial Veterinary Service are announced:—Mr. A. H. Milne, M.R.C.V.S., Veterinary Officer, Nyasaland; Mr. H. W. C. Newlands, M.R.C.V.S., Veterinary Officer, Tanganyika Territory, and Mr. R. H. Owen, M.R.C.V.S., Veterinary Officer, Gold Coast.

. . . . .

Ministry's Laboratory Staff Changes.—Mr. W. L. Wilson, M.R.C.V.S., a member of the Ministry's Field Staff, was attached for duty at the Veterinary Laboratory of the Ministry of Agriculture and Fisheries, New Haw, Weybridge, on December 4th, 1939, and Mr. J. S. Garside, M.R.C.V.S., D.V.S.M., resigned from the Ministry's service with effect from December 31st, 1939.

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R.C.V.S. OBITUARY

Brown, Alexander, Neilston, Renfrewshire. Graduated Glasgow, April 24th, 1883. Died January 2nd, 1940, aged 80 years.

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LEGAL NOTES

Sale of Tuberculous Meat.—" I do not say anything against meat inspectors, but this is the only civilised country where the inspection of meat is not carried out by qualified veterinary surgeons," said Mr. C. L. Hodgkinson (solicitor) at Wednesbury Police Court recently.

He was (says the *Wolverhampton Express and Star*) defending John Levis, butcher, Bilston Road, Wolverhampton, summoned for selling unfit meat in Wednesbury market on September 30th.

Mr. J. B. Brown, prosecuting on behalf of Wednesbury Corporation, said that at Levis's stall, of which George Davis was in charge, a Wednesbury inspector saw a beast's tongue, part of a gland of which was found on examination to be tuberculous.

Mr. Hodgkinson said it was an interesting case because the tongue was passed by an inspector at Wolverhampton abattoir before it was taken to Wednesbury for sale. The inspector, he added, could not attend court that day.

The general principle, remarked Mr. Hodgkinson, was that before a man could be convicted of an offence it must be shown that he knew all about the offence and that he had a guilty mind in connection with it. Levis, he contended, was innocent, and because there was no guilty knowledge he asked that the case should be dismissed.

The bench might think it creditable that a Wednesbury inspector found a tuberculous state in a piece of meat and the Wolverhampton inspector did not; but Levis certainly thought it correct to offer for sale meat which

had been passed at the important abattoir at Wolverhampton.

The bench, after a short retirement, imposed a fine of £5.

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UNIVERSITY OF LONDON EXAMINATIONS IN VETERINARY SCIENCE

Following is the December, 1939, pass list for the examinations in Veterinary Science convened by the University of London :—

Second Examination—for internal and external students—(*Part II*): Boreham, Margaret Joan (Royal Veterinary College), Hall-Patch, Peter Kenelm Joseph (Royal Veterinary College), Jordan, Frank Tudor Whitney (Royal Veterinary College), Paterson, Alexander Brown (Glasgow Veterinary College), and Purkis, Barbara Mary (Royal Veterinary College).

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WHOLESALE MEAT TRADING

The Ministry of Food announced on Friday of last week that eight wholesale meat supply associations, comprising all meat wholesalers in the country, acting as agents of the Ministry of Food, will take over wholesale meat distribution on Monday next when full control of meat and livestock is introduced. After midnight on January 15th individual meat wholesalers will cease for the present to trade on their own account. All private slaughtering will cease from midnight, Sunday, January 14th, and the Ministry will purchase from wholesalers all meat and livestock then in their hands.

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PIGS AND POULTRY FEEDING: A PREFERENCE SCHEME

A recent Ministry of Agriculture announcement makes reference to the fact that pig and poultry farmers were warned some time ago that the prospective supplies of imported feeding stuffs were such that over the next 12 months they must expect a deficiency of at least one-third of normal quantities, and that they should plan their production programmes accordingly, and proceeds: "They must make their plans on the assumption that the present difficulties are not likely to be substantially eased, at any rate during the next few months. The deficiency applies, in particular, to imports of cereals and cereal by-products, on which pigs and poultry mainly depend.

"Poultry keepers who are faced with serious feeding stuffs shortage will no doubt find it necessary rigorously to 'cull' their flocks, in order to eliminate the birds which give a poor return for the food consumed, *i.e.*, poor producers, unhealthy birds, and bad 'doers.' The need for drastic culling applies in particular to poultry stocks of mixed breeds and uncertain age on many general farms which enjoy advantages for feeding birds with tail corn and other waste products of the farm. Some poultry keepers have been able to obtain almost as much feeding-stuffs as before the war. Such persons are earnestly asked to limit purchases to their absolute minimum requirements, and to make every use of available home-produced alternative feeding-stuffs, so that less fortunate poultry keepers may be able to obtain a greater share of their requirements. In every case determined efforts should be made to utilise any available materials which though normally regarded as 'waste' may have some feeding value for poultry. Where free range is available the fullest possible use should be made of it.

"It would be unwise for pig producers who rely mainly on purchased food to attempt to bring pigs to heavy weights, and it would be more prudent to market pigs as soon as they have reached minimum bacon weights—not more than seven score pounds. By such means it should be possible to avoid a serious reduction of breeding stock, which would otherwise jeopardise the future of the industry.

"The Government desire that the premature slaughter of good pigs and poultry should be avoided as far as possible, and they are prepared for a short period to do what they can to arrange that such preference as may be possible—subject to the prior claims of dairy and feeding cattle and sheep—is given to producers who are mainly dependent on pig and poultry keeping for their livelihood.

"Where land suitable for cultivation and the necessary facilities are available, efforts should be made to grow food for pigs and poultry.

Foot-and-Mouth Disease

"Owing to the reduction in the supplies of imported feeding stuffs pig-keepers are being advised to seek alternative forms of food for their animals. Efforts are being made by Government Departments and others concerned to ensure that the large amount of material represented by table and kitchen waste is made available for feeding to pigs. This waste, however, includes scraps of foods brought to this country from all parts of the world, and many of the supplying countries are infected with foot-and-mouth disease. To avoid the risk of setting up the disease in pigs the law requires that kitchen waste, commonly known as 'swill,' or any material of animal origin, shall be boiled for an hour before it is fed to animals, and the national interest calls for strict compliance with this requirement.

"In pigs lameness is the chief and often the only sign of disease. This fact is not sufficiently recognised and its importance is emphasised by recent outbreaks which have started among pigs. Lameness among pigs should be viewed with suspicion and should be promptly reported to the police as suspected foot-and-mouth disease so that an examination can be made without delay."

* * * * *

POULTRY-KEEPING BY HOUSEHOLDERS

Where opportunity offers practitioners are advised to warn householders who are commencing to keep poultry that they should purchase only good stock offered by breeders and not from auction sales or from advertisements of "cheap" birds. From what we hear the *post-mortem* examination of many birds received from smallholders and owners now utilising a portion of their garden for stock, reveals that these birds are very poor specimens, obviously culls and probably contacts of outbreaks of disease.

* * * * *

FARMERS' "VITAL CONTRIBUTION"

"Once again to the rural community falls the duty and the privilege of making a vital contribution to the needs of the country in a time of emergency," said Sir Reginald Dorman-Smith, Minister of Agriculture, addressing the Farmers' Club on Monday last. Sir Reginald spoke of the desire of the Government and the agricultural industry to work in close co-operation towards a common end. Since the outbreak of the war (he said) the spirit of co-operation had shown itself abundantly in all sections of the industry.

At the outbreak of war farmers and farm workers were asked to embark on the formidable task of ploughing up at least 2,000,000 acres of grassland. The response, so far, had been magnificent. Already, after less than 130 days of war, well over 1,000,000 acres in England and Wales alone had been selected and scheduled for ploughing and much had already been ploughed. Very much more would have been turned over had it not been for bad weather conditions. The task allotted to farmers was at least as great as that given to any other section

of the community. This, however, was only a first instalment because they must count on the certainty of a sterner effort in 1940-41 if the war continued. Reviewing the condition of the industry and the changes which had taken place since the last war, Sir Reginald Dorman-Smith referred to the continuous decline in arable acreage which was not checked until last year and to the great number of workers who had left the land. The arts of ploughing and of cultivation, he said, might in some districts have become lost arts. No country could exist that lost the art of husbandry of its land. It was that line of thought that had prompted the policy of encouraging a return to the plough, of giving a greater degree of security to the producer of oats and barley and other crops. This was more than a policy for war-time emergency; the destiny of British farming was linked up with a system of mixed farming, and it was hoped that when peace returned that lesson would not be forgotten.

The immediate task was to produce the maximum amount of food in the shortest possible time. No one would dispute the need to increase production by ploughing up, but indiscriminate ploughing would not ensure the best use of the soil. They must select the land that would respond best to ploughing and make preparations by drainage schemes for their campaign next autumn. He had an unshakable confidence in the men on the spot who were animated by the desire to serve their country. It was the Government's job to create conditions that would enable production to increase. Under no known system of government could production increase at a loss. The main problem was that of prices. They were trying to arrive at a general level of prices. Prices could only be fixed having regard to known factors. Any new circumstances arising to increase production costs would be taken into consideration.

The Livestock Market

It was a matter of great importance to the livestock men that they would now enjoy a guaranteed market. The Government recognised that in fixing prices regard must be paid to the need for a reasonable wage to the worker. Credit was another essential to a forward agricultural policy. The Government's endeavour was to establish agriculture as a fully credit-worthy industry no less capable of borrowing at normal commercial rates than any other great industry.

With regard to animal feed, he admitted that there was an acute scarcity of supplies of certain feeding stuffs, particularly for pigs and poultry. The question was one of tonnage and getting supplies safely across the sea. He was advised that future prospects were decidedly better than in recent weeks.

The Government were determined to avoid a repetition of the disasters that followed the last war and would aim at moderate controlled increases and not exaggerated prices for livestock and crops. Thus agriculture would be able to change from war to peace-time conditions without drastic changes of policy.

* * * * *

MINISTRY OF AGRICULTURE NEWS SERVICE ITEMS

The Ministry of Agriculture News Bulletin for January 2nd includes the following sections likely to be of interest to many of our readers:—

Britain Can Keep More Sheep

Under the above heading the *Bulletin* observes: Of all our farm animals the sheep alone could face a long war without a ration card. In open field or on mountain side she satisfies practically all her needs from the green earth and fortunately we have the densest sheep population in the world with the single exception of New Zealand. But even so we have room for many more. We have 23 million acres in grass and about 18 million sheep, of which 8½ million are ewes. It is generally considered safe to keep one ewe to two acres on most kinds of farms carrying cattle and sheep. In 1867, when the first returns were recorded, we had 22 million sheep and that before Sir George Stapleton had shown us how to clothe the Welsh hilltops with grass and improve so much the carrying capacity of our pasture. There are thousands of acres where only cattle graze but sheep could be added without any need to decrease the cattle. Sheep prefer the shorter grasses that the cattle ignore and the cattle keep the pasture healthier for the sheep.

Improving Hill Pasture.—If, as we so well might do, we increase our sheep, it is important to visualise the problem as a whole. The mountain sheep breeds are essential for the maintenance of lowland flocks, but they are also especially valuable because they utilise vast tracts of hill country that would otherwise play little or no part in providing us with food. Hill and valley are complementary in this respect. The lower ground gives shelter and winter food, the high ground abundant summer grazing. But the land on both hill and valley has deteriorated for various reasons, so that the herbage has lost much of its feeding value. Pasture is almost the only requirement of hill sheep throughout the year, but it must be reasonably good pasture. It is essential, therefore, in any forward sheep policy, to improve these marginal grazing lands especially since hill sheep, that already out-number all the other kinds put together, are becoming more and more the source from which most lowland flocks are recruited each autumn.

At Lambing Time.—The ewes of these "flying flocks," whose nursery is the hills, are wintered almost entirely on grass that would otherwise be unstocked or at least carry a handful of store cattle. About one month before lambing it has been customary with flocks breeding in February to give a little concentrated food, *e.g.*, ½ to 1 lb. per head per day of some such mixture as two parts oats, two parts bran and one part oil cake. But many flocks lamb down successfully even in February on good hay, rock salt and free range.

In such circumstances some artificial feeding is necessary after lambing, but the ration can be made up of home-grown or other products unwanted by man, such as oats, bran, linseed cake or linseed, beans, brewers' grains and peas.

In stimulating the milk flow, nothing will take the place of fresh green grass, hence the importance of stimulating an "early bite." The next best thing, but only a second best, is an adequate supply of kale, mangolds or sugar beet pulp.

Home Grown Linseed: A Valuable Feeding Crop

On this topic the *Bulletin* states: There seems to be some doubt as to whether linseed may be grown as a crop on land ploughed up and earning the £2 per acre grant. The County Committees have authority, at their discretion, to agree to this crop being grown. In fact it has many things to recommend it as a feeding crop, apart from the question of flax. Any good medium soil is suitable, it does quite well on the type of chalk land where barley flourishes and neither wireworm nor leatherjackets attack it. Its high content of oil (35-37 per cent.) and of protein (24 per cent.) makes it particularly useful for dairy cows, fattening bullocks and calves.

Linseed meal is whole linseed ground up to a meal without the subtraction of any of its oil.

Linseed cake is the compressed residue after a large part of the oil has been pressed out.

It is wasteful to feed untreated linseed, as a considerable portion of the seeds usually passes through undigested by the animal, nor should it ever be used with only a mere preliminary soaking. If moistened at all, it should be boiled or steamed to prevent fermentation producing dangerous substances.

Linseed jelly is made by stirring the crushed seed in boiling water (10 lb. seed to 20 gallons water), then

adding a little cold water, bringing to the boil again and keeping on the boil for 20 minutes. This jelly can be incorporated with chaff, hay, bran, potatoes, straw, damaged grain, green food or other similar material.

* * * * *

AN HISTORIC "MILKING TRIAL"

In the December issue of the Ayrshire Cattle Society's quarterly *Journal* there appears an interesting account of the first milking trial ever held in connection with the show of the Ayrshire Agricultural Association. It took place at Ayr 79 years ago, at the show which opened on April 19th, 1860, and lasted for four days, and prize money to the value of £10 was put up by the Duke of Atholl. The report of the trial which appeared in the *Ayr Advertiser* at that time is quoted at some length, together with the judge's report at the trial. The £10 prize was offered for "the cow which might give the greatest quantity of milk in the course of five days." According to the *Ayr Advertiser,* it was the opinion of the Duke, as well as of many practical Ayrshire breeders, that many of the judges in those days based their decisions too much upon a few points, and gave too much consideration to the appearance of the milk vessel in the ring, which led to the somewhat cruel practice of "hefting"; whereas there was a feeling that the primary object of a show of Ayrshire stock ought to be to encourage the breeding of cows which gave the most valuable produce, and, in a less degree, which had an aptitude to fat when not giving milk. "Fine symmetry and colours," states the report, "although important in the estimation of every person of taste, are really of secondary importance, and almost everyone will admit that the farmer should regard elegance as subordinate to usefulness in the selection of his stock." Some breeders, it was admitted, had been quite successful in combining elegance with usefulness, but it was to be doubted whether sufficient prominence was generally given to the latter quality in the competitions. Twelve cows were entered for the competition in 1860, and eight of them took part.

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

* * * * *

THE ZOO AND THE VETERINARY PROFESSION

To the Editor of the Veterinary Record

Sir,—Like Mr. Edward Morgan, as indicated in his letter in your last week's issue, I also have an uncomfortable feeling—in spite of the fact that the London Zoological Society placed a veterinary surgeon in charge of Whipsnade—that the Society's experts are inclined to ignore the practical experience of the veterinary profession when dealing with their many animal problems.

For instance: some years ago one of the London papers had a note to the effect that a daughter of one of the Curators was having lessons in massage with the idea of curing one of the chimpanzees of rickets. I wrote the Curator and suggested a simple treatment which I had found successful with two Capuchin monkeys which my wife had. He thanked me and said he would try it.

More recently I read that one of the two £1,000 gorillas had died from kidney trouble. I wrote the Secretary suggesting that possibly the poor anthropoid had been killed by kindness; in other words, that they had not only been giving it too much food for the amount of exercise it had been getting, but that they had been giving a herbivorous animal a certain amount of carnivorous food. He replied that I was quite in error, and, to clinch his argument, mentioned that the other gorilla was quite all right. Not very long after the other one died from, I believe, a similar pathological condition. Therefore probably we were both wrong!

Yours faithfully,

R. Glave Saunders.

The Guildhall,
Exeter.
January 8th, 1940.

DISEASES OF ANIMALS ACTS, 1894 to 1937, and AGRICULTURE ACT of 1937 (PART IV)

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 1st to 15th Dec., 1939...	16	17	1	32	—	—	16	164	95
Corresponding period in ...									
1938	42	51	3	522	1	1	24	66	46
1937	37	37	20	4,922	4	28	28	16	3
1936	26	29	21	1,185	2	2	17	56	39
Total 1st January to 15th Dec., 1939	682	774	87	10,747	33	73	262	3,128	3,018
Corresponding period in									
1938	794	1,196	179	22,889	46	76	208	897	720
1937	692	825	129	23,633	110	173	245	956	563
1936	431	510	59	4,830	103	245	222	1,812	1,245

Note.—The figures for the current year are approximate only. § Excluding outbreaks in Army Horses.

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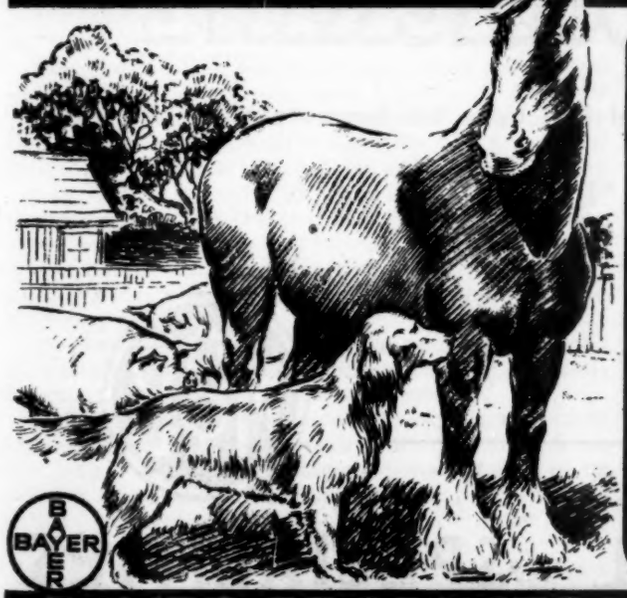

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